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(71) Applicant: HURON PRODUCTS INC. [US/US]; 30600 Commerce Boulevard, New Haven, MI 48084-1000 (US).

(72) Inventors: McNAUGHTON, James ; 1096 Hackberry, Rochester, MI 48063 (US). SOLOCINSKI, Michael ; 12214 Anthony, Shelby Township, MI 48315 (US).

(74) Agent: JAMBOR, Robert, V.; Kinzer, Plyer, Dorn, McEachran & Jambor, 55 East Monroe Street, Suite 3905, Chicago, IL 60603 (US).

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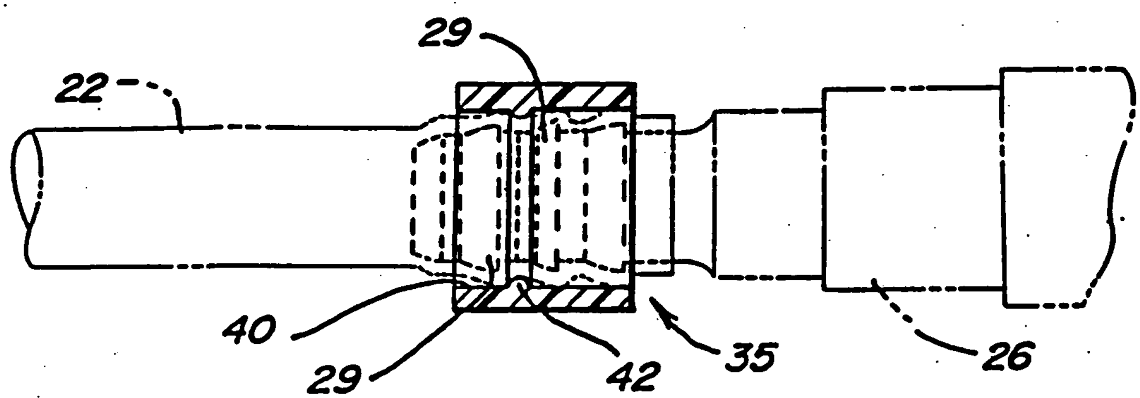

(57) Abstract

A ring clamp (20, 35, 49, 59, 69, 79, 89, 99, 109, 200, 210, 220) secures a flexible hose (22) onto a barbed fitting (26) with an interference fit. The ring clamp is preferably formed f a material which is more resistant to thermal deformati n than the hose (22), such that the ring clamp is able to resist n rmal temperature cycling. Preferably, the ring clamp is used in a vehicle and is resistant t deformation at temperature extremes between -40 °F up to 300 °F. A series f different ring clamps (20, 35, 49, 59, 69, 79, 89, 99, 109, 200, 210, 220) having vari us cross-secti nal shapes are discl sed. In several embodiments radially inwardly extending members (52, 74, 92, 112) extend from an inner peripheral surface of the ring clamp into spaces between adjacent barbs

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"Ring Clamp for Securing a Hose to a Barbed Fitting"

BACKGROUND OF THE INVENTION

The present invention relates to a clamp for securing a hose to a barbed fitting.

Clamps to hold flexible hoses on a barbed fitting have typically used an interference fit. The terms hose and fitting as used in this application may apply to any type of fluid lines. Once these clamps have been subjected to heating and cooling cycles, the clamp dimension may sometimes change, and the connection between the fitting and the hose weakens. For fluid lines in a vehicle, the clamp may be exposed to a temperature range of -40°F to 300°F. These extreme temperatures have caused prior art clamps to weaken.

To address the problem, metal hose clamps have be n utilized which are crimped onto the hose. These clamps may sometimes apply undesirable stress to the hose.

SUMMARY OF THE INVENTION

One embodiment of the present invention provides a polymeric ring clamp which press fits the hose against the fitting barbs. The ring clamp is formed of a material with a higher resistance to temperature extremes than the hose. That is, the ring clamp preferably has a lower coefficient of thermal expansion than the flexible hose. Most preferably, the ring clamp is resistance to any significant expansion or contraction over a temperature range of -40°F to 300°F. A ring clamp made according to this teaching in a vehicle exerts a substantially continuous hoop stress holding the hose on the fitting during typically heating and cooling cycles. Preferably, the ring clamp may have a radially inwardly extending member which squeezes the hose between adjacent barbs on the fitting. In a most pr ferred embodiment of th present invention, th radially inwardly extending members may be ramped to facilitat the sliding mov ment of th ring clamp ov r th barbs to s cure the hose to the fitting.

In another aspect of th pr sent invention, a method of securing a fl xibl hose to a barbed fitting is disclosed wherein a generally cylindrical ring clamp is formed of a material that is more resistant to thermal expansion or contraction than the flexible hose. The ring clamp has an inner peripheral surface which defines an inner diameter that is less than the outer diameter of the flexible hose received on the barbs. The ring clamp is slid over the hose and fitting, such that its inner peripheral surface squeezes the hose radially inwardly at the barbs to secure the hose to the fitting.

These and other objects of the present invention can be best understood from the following specification and drawings, of which following is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional view of a first embodiment fluid connector.

Figure 2 is a cross-sectional view of a second embodiment fluid connector.

Figure 3 is a cross-sectional view of a third embodiment fluid connector.

Figure 4 is a cross-sectional view of a ring clamp according to a fourth embodiment of the present invention.

Figure 5 is a cross-sectional view of a fifth embodiment ring clamp.

Figure 6 is a cross-sectional view of a sixth embodiment fluid connection.

Figure 7 is a cross-sectional view of a seventh embodiment fluid connector.

Figure 8 is a cross-sectional view of an eighth embodiment ring clamp.

Figur 9 is a cross-sectional view of a ninth mbodiment ring clamp.

Figur 10 is a cross-sectional vi w of a tenth embodim nt fluid connector.

Figure 11 is a cross-s ctional view of an eleventh embodim nt fluid connector.

Figur 12 is a cross-sectional view of a twelfth embodiment fluid connector.

Figure 13 is a cross-sectional view of a thirteenth embodiment fluid connector.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 is a cross-sectional view of a cylindrical ring clamp 20 which provides an interference fit to secure a flexible hose 22 on barbs 24 formed on fitting 26. Ring clamp 20 may be manufactured from polymeric or metallic materials. Hose 22 is preferably manufactured from known polymeric or elastomeric materials. Typically, a rubber material is used. Fitting 26 is a fluid conduit having a cylindrical extending nipple 28 with barbs 24 extending radially outwardly therefrom. Fitting 26 may be manufactured from a polymeric or metallic material.

In assembling the first embodiment ring clamp 20 onto hose 22, ring clamp 20 is first positioned on hose 22 as illustrated in phantom at 29 in Figure 1. Ring clamp 29 is then moved along hose 22 and barbs 24 into an interference fit with an outer peripheral surface of hose 22. Ring clamp 20 includes an annular wall 30 having an outer circumferential surface 32 and an inner circumferential surface 34. Outer circumferential surface 32 is generally smooth. Inner circumferential surface 34 is also substantially smooth in the embodiment shown in Figure 1.

In preferred embodiments of the present invention, clamp ring 20 is formed of a material which is resistant to expansion or contraction over a wide temperature range. Preferably, the material is resistant to thermal expansion or contraction over a temperature range from -40°F to 300°F. Further, clamp ring 20 is prefearbly formed of a material that has a lower coefficient of thermal expansion than the mat rial of hos 22. In that way, it is gen rally ensured that ring clamp 20 will retain its dimension and firmly s cur hose 22 on fitting 26.

Figure 2 illustrat s a second embodiment ring clamp 35 having an annular wall memb r 30 with an inn r peripheral surfac 40 that includes a radially inwardly projecting member 42. Radially inwardly projecting memb r 42 has a semi-circular shape as shown in Figure 2. Projecting member 42 nests between adjacent barbs 24 to squeeze hose 22 into a depression formed between adjacent barbs 24. With this embodiment, it is still preferred that inner peripheral surface 40 defines an inner diameter that is less than the outer diameter of barbs 24 and the thickness of hose 22 such that there is also radially inward securement of hose 22 to connector 26 at each barb 24. The formation of member 42 may be such that it defines an inner diameter that is less than the outer diameter of barbs 24, and is resilient such that it deforms radially outwardly to allow passage over barbs 24. Alternatively, the inner diameter of member 42 may be greater than the outer diameter of barbs 24, but less than the out r diameter of barbs 24 with the addition of hose 22. In this way, member 42 still squeezes hose 22 onto connector 26. Figure 3 shows a third embodiment ring clamp 49 having inner peripheral surface 50 with a pair of radially inwardly extending members 52 and 54, which are formed similar to member 42, and spaced between adjacent barbs 24.

Figure 4 shows a fourth embodiment of ring clamp 59 having an inner peripheral surface 60 with a radially inwardly projecting member 62 that has a rectangular shape. Figure 5 shows a fifth embodiment ring clamp 69 having an inner peripheral surface 70 with two radially inwardly extending members 72 and 74. Again, members 72 and 74 are generally rectangular in cross-section. The rectangular cross-section may be simpler to form than the semi-cylindrical cross-section of the earlier embodiments.

Figure 6 shows a sixth embodiment ring clamp 79 having inner peripheral surface 80 with a radially inwardly proj cting member 82 having a cross-sectional shape of a truncat d con . Figur 7 shows a seventh embodim nt ring clamp 89 having a pair of radially inwardly extending members 92 and 94 which are also truncated cone-shaped in cross-section. The truncated con -shape inwardly pr jecting members 82, 92 and 94 pr sent a ramped surface to thebarbs 24 as clamp 89 is being forced over hose 22. This reduces the force necessary to mount ring clamp 89 onto hose 22.

Figure 8 shows an eighth embodiment ring clamp 99 having an inner peripheral surface 100 with a radially inwardly projecting member 102. Member 102 has a surface 103 extending perpendicularly to a central axis of ring clamp 99 and facing away from fitting 26. Member 102 also has a ramped surface 104 facing fitting 26 and a flat radially inner surface 106 which is squeezed between adjacent barbs 24. Figure 9 shows a ninth embodiment ring clamp 109 having an inner peripheral surface 110 with a pair of radially inwardly extending members 112 having a shape similar to member 102. The ramped surfaces 104 facing fitting 26 facilitates sliding movement of ring clamps 99 or 109 onto hose 22. The flat outwardly facing surfaces 103 prevent inadvertent removal of ring clamps 99 or 109 by providing a stop against removal from barbs 24.

Figure 10 shows a tenth embodiment ring clamp formed of a sing ring 200 which has an inner diameter great r than the outer diameter of barb 22, and less than the out r diameter of barb 22 with hose 22 received on it. In this way, ring 200 secures hose 22 onto fitting 26 by being squeezed between adjacent barbs 24. Figure 11 shows an eleventh embodiment ring clamp 210, wherein a pair of rings 200 are used.

Figure 12 shows a twelfth embodiment ring clamp wherein a ring 220 having a square cross-sectional shap is used to secure tube 22 to fitting 26. Figure 13 shows a thirteenth embodiment wherein a pair of rings 220 are used.

In a method according to the present invention, a clamp member having an inner peripheral surface spaced from an axis of the ring clamp by a distance less than the combined outer diameter of the barbs and th flexible hos is slid ont th flexible hose to secur the flexible hose to th barbed fitting. The ring clamp may have radially inwardly extending members in any of a vari ty of shapes, and s cures th hose onto th fitting. Further, the ring clamp is formed f a material that is more resistant to thermal deformation than th flexibl hos . In this way, the ring clamp ensures that the hose will remain securely fastened onto the fitting over the normal operating ranges encountered by the fluid connection.

In one embodiment of the present invention, th ring clamp was formed of a polymeric material. one embodiment was formed of polyphenylene sulfide (PPS). Filled polymers, and composite structures reinforced by other material may also be used. Alternatively, the ring clamp can be formed of a metallic material. Preferably, a ferrous metal or aluminum is used.

Several preferred embodiments of the present invention have been disclosed, however, a worker of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. For that reason the following claims should be studied in order to determine the true scope and content of this invention.

CLAIMS

What is claimed is:

1. A clamping syst m comprising:

a fitting having at least one barb extending radially outwardly from an outer peripheral surface;

a flexible tube received radially outwardly of said fitting at said at least one barb; and

a polymeric clamp ring received radially outwardly of said hose at an axial position aligned with said barb, an inner peripheral surface of said clamp ring at said barb having an inner diameter which is less than the outer diameter of said hose at said barb, and said ring clamp being more resistant to thermal deformation than said hose.

2. A clamping system as recited in claim 1, wherein there are a plurality of said barbs.

3. A clamping system as recited in claim 2, wherein said clamp ring has a smooth continuous interior surface.

4. A clamping system as recited in claim 2, wherein said clamp ring is generally resistant to thermal deformation over a temperature range from -40°F to 300°F.

5. A clamping system as recited in claim 4, wherein said ring clamp is formed of polyphenylene sulfid .

6. A clamping system as recited in claim 2, wherein said ring clamp has at least one radially inwardly projecting member which is aligned with a space between adjacent barbs.

7. A clamping system as recit d in claim 6, wh r in said radially inwardly projecting member has an overall rectangular shape in longitudinal cross-s ctin.

8. A clamping system as r cited in claim 6, wh rein said radially inwardly proj cting m mber has an overall truncated conical shape in longitudinal cross-sectin.

9. A clamping system as recited in claim 6, wherein said radially inwardly projecting member has an overall wedge shape in longitudinal cross-sectin.

10. A clamping system as recited in claim 6, wherein said radially inwardly projecting member has an overall arcuate shape in longitudinal cross-sectin.

11. A clamping system as recited in claim 2 further comprising a pair of annular members adapted to be positioned between adjacent barbs.

12. A clamping system as recited in claim 11, wherein said pair of annular members has a circular cross-sectin.

13. A clamping system as recited in claim 11, wherein said pair of annular members has a rectangular cross-section.

14. A method of clamping a hose to a barbed fitting comprising the steps of:

providing a fitting having a plurality of barbs extending radially outwardly of said barbs, such that the outer diameter of an outer peripheral surface of said hose at said barbs is generally the outer diameter of said barbs plus the wall thickness of said hose;

providing a ring clamp having an inner peripheral surface spaced from an axis of said ring clamp by an inner diameter which is less than the outer diameter of said barb plus the wall thickness of said hose, the ring clamp b ing formed of a mat rial which is more resistant to th rmal d formation than said hos ; and

sliding said ring clamp axially along said hose such that said ring clamp is axially aligned with said barb and squeezes said hos onto said fitting.

15. Th method as recited in claim 14, wherein said ring clamp is formed of a polymeric material.

16. The method according to claim 14 further comprising the step of providing said ring clamp with at least one radially inwardly projecting members extending from said inner peripheral surface and positioning said members between adjacent barbs on said fitting.

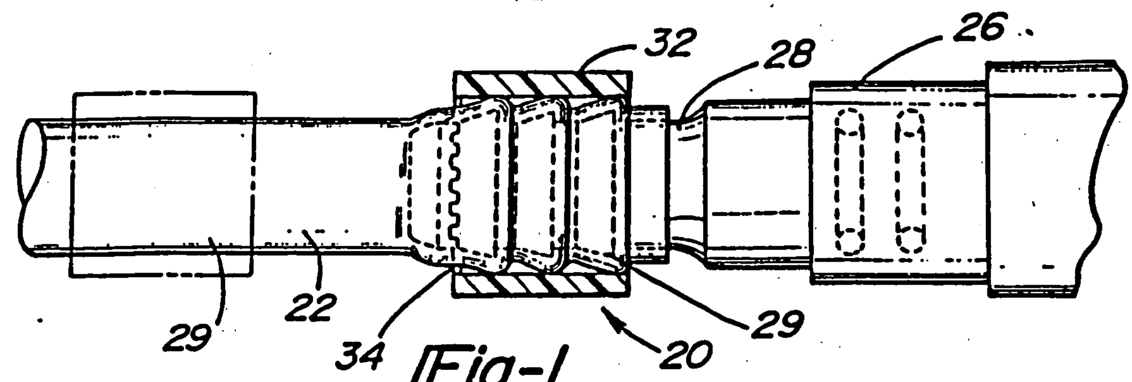


Fig-1

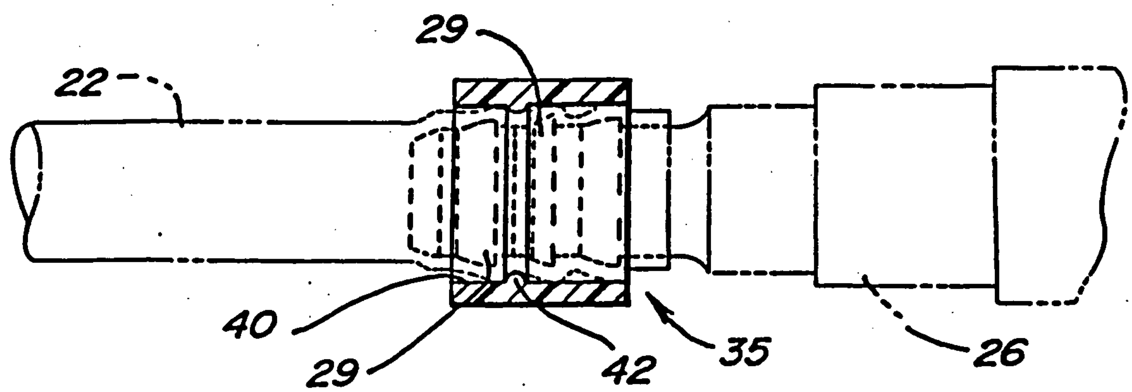


Fig-2

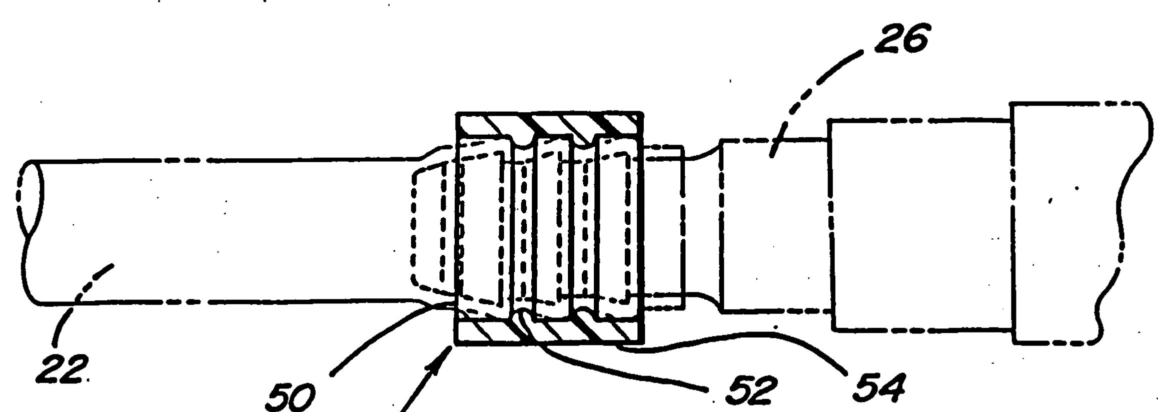


Fig-3

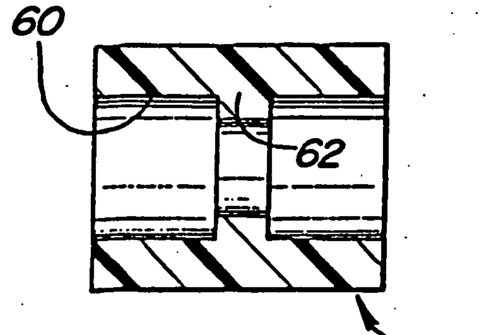


Fig-4

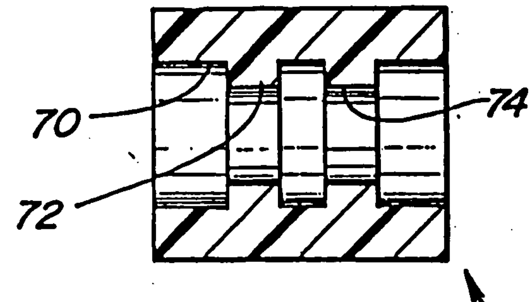


Fig-5

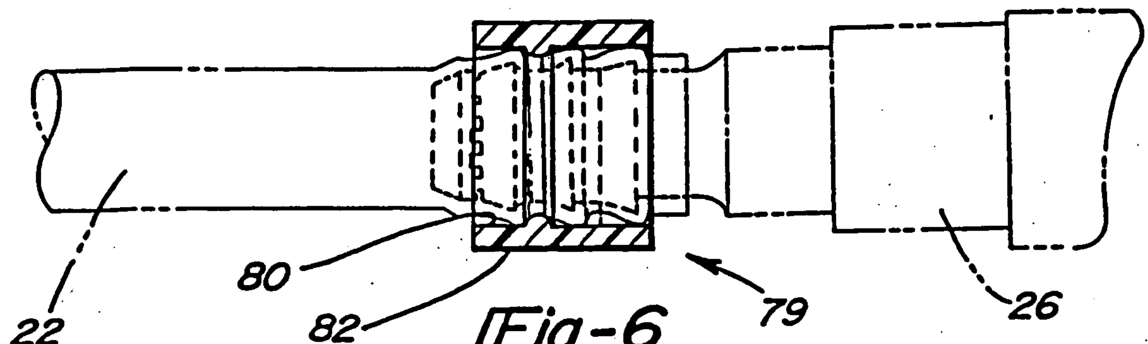


Fig-6

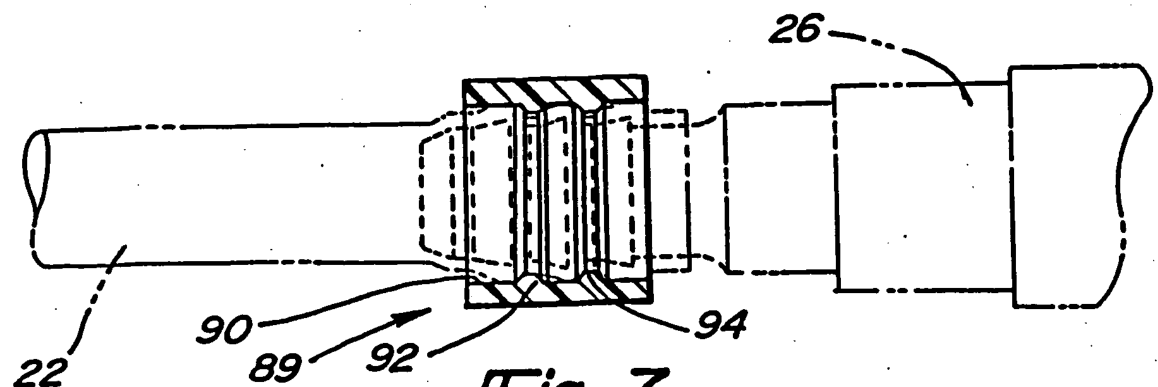
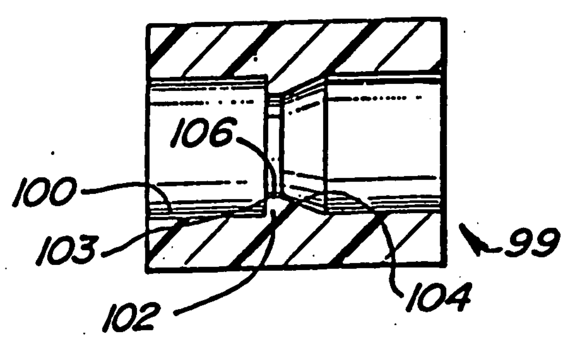
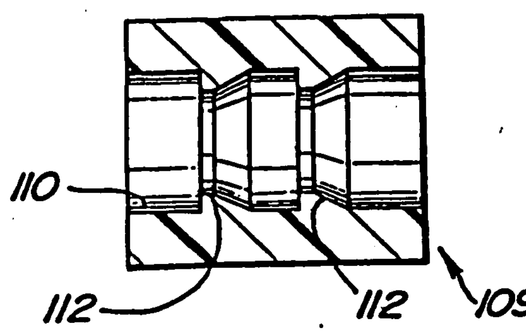


Fig-7





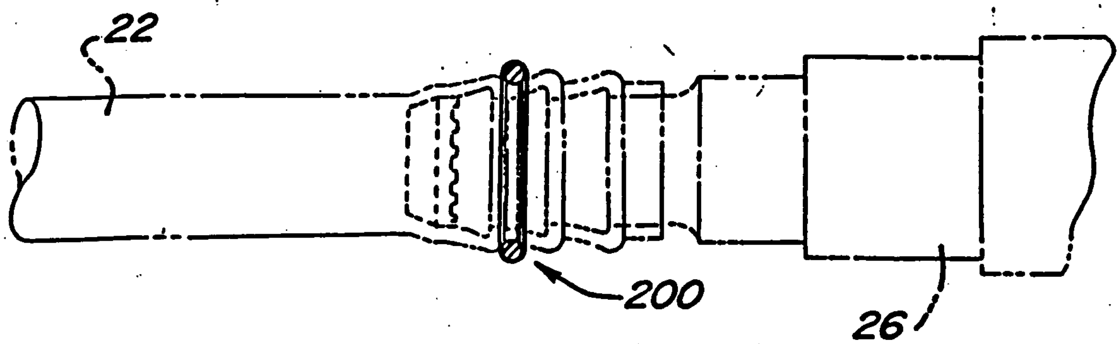


Fig-10

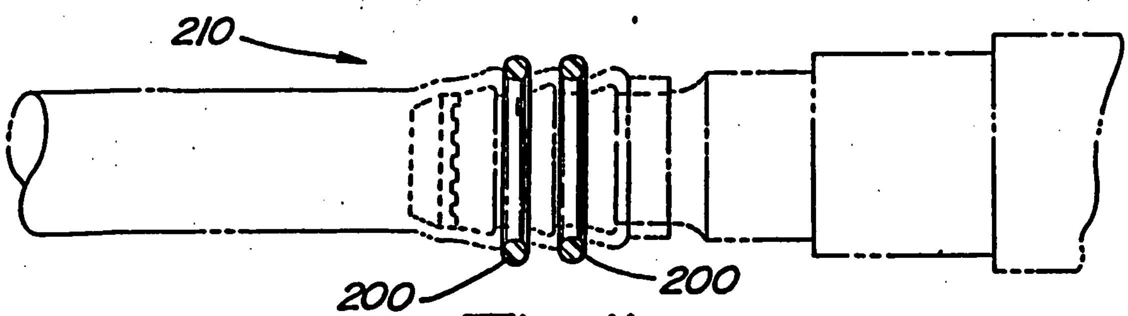


Fig-11

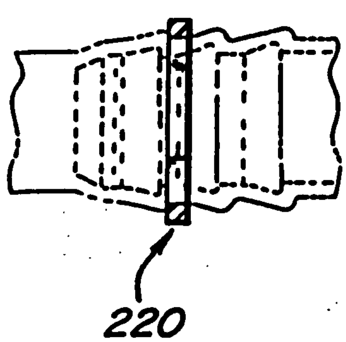
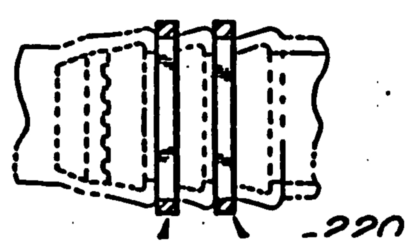


Fig-12



INTERNATIONAL SEARCH REPORT

PCT/US93/01416

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :F16L 33/00
US CL :285/242
According to International Patent Classificati n (IPC) r to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentati n searched (classificati n system f llowed by classification symbols)

U.S. : 285/242 285/242,258,259,331,332.4,423

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim N .
A	US,A, 3,315,986 (Quick) 04 April 1967	1,2,3,5
A	US,A, 2,087,180 (Bohn) 13 July 1937	3
X Y	US,A, 3,484,121 (Quinton) 16 December 1969	1-3 1,2,4
Y X	US,A, 4,537,183 (Fogarty) 27 August 1985	1,2,4 1,2,6,10
X	US,A, 4,635,972 (Lyall) 13 January 1987	1-3
Y	US,A, 2,260,454 (Hedeman) 28 October 1941	1,2,4
A	US,A, 2,902,299 (Turner) 01 September 1959	3,6,10

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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07 JULY 1993	

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